

## ABSTRACT

Contamination of the ion-exchange membrane in an electrochemical fuel cell can significantly reduce the lifetime. One source of contamination is from sealant materials, particularly if the sealant is silicone and impregnated into the peripheral region of the membrane electrode assembly (MEA) and thus in close proximity to the ion-exchange membrane. Contamination may be reduced or eliminated by separating the electrochemical reaction and/or the ion-exchange membrane from the sealant material. In an embodiment, this is done by having the sealing region substantially free of active electrocatalyst particles (for example, selectively printing the catalyst to avoid the sealing region or poisoning catalyst in the sealing region). In another embodiment, a barrier film is interposed between the ion-exchange membrane and the sealant material impregnated into the MEA. In yet another embodiment, a barrier plug is impregnated into the fluid diffusion layer adjacent to the sealant material impregnated into the MEA.

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